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REMARKSCLAIM REJECTION UNDER 35 U.S.C. § 101

Claims 1 – 8 were deleted and claims 9, 15, 18 – 21 amended and new claims 22 and 23 added by Preliminary Amendment filed October 17, 2003. Claim 15 in particular was amended by deletion of reference to method claim 7. Claim 15 accordingly is believed in order for prosecution with dependent claims 16 and 17.

CLAIM REJECTION UNDER 35 U.S.C. § 112

Claims 15 – 17 are believed to comply with 35 U.S.C. 112 in view of amendment by Preliminary Amendment, discussed above. Claims 18 – 23 have been deleted by the instant amendment.

CLAIM REJECTION UNDER 35 U.S.C. § 102

Claims 9 – 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Benton, U.S. Patent No. 2,748,863.

Claim 9 as amended defines:

An apparatus for continuously cutting unpapered freshly pasted expanded, punched or cast lead or lead alloy mesh strip into paperless battery plates comprising a cutting roll having cutting blades mounted thereon and an opposed anvil roll for cutting the pasted lead or lead alloy mesh strip therebetween into equal lengths, means for journaling said rolls in operative abutment with each other in a supporting frame, conveying means for continuously passing the freshly pasted lead or lead alloy mesh strip between the opposed rolls, and heating means for heating the cutting blades and opposed rolls to a temperature in the range of about 160 to 360°C.

Benton relates to a perforating machine for thermoplastic films comprising a perforating cylinder having closely spaced tapered pins arranged in annular rows, an anvil roller having annular ridges defining grooves in register with the annular rows of pins on

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perforating cylinder and anvil roller. Means are provided to heat the perforating cylinder and tapered pins to a temperature which will cause plastic flow of the film in contact with the pins (300 - 375°F = 149 - 190°C) and means are provided to maintain the anvil roller artificially cool. The apparatus produces perforated thermoplastic film (Figure 2).

Applicants' apparatus in distinction relates to an apparatus for cutting freshly pasted expanded, punched or cast lead or lead alloy mesh strip into paperless battery plates using a cutting roll having cutting blades mounted thereon and an opposed anvil roll, and means for heating the cutting roll, cutting blades mounted thereon and the anvil roll to obviate sticking of the paste thereto.

Benton does not have or suggest cutting blades or heat means for heating blades or both rolls but clearly discloses tapered perforating pins mounted on a perforating cylinder, means for heating the perforating cylinder and associated tapered pins to a temperature in the range of 300 - 375°F for melting plastic film, and means for cooling the anvil roll.

The Benton reference clearly is not analogous prior art in that it is not in Applicants' field of endeavour and is not reasonably pertinent to the particular problem with which Applicants' invention relates. *In re Oetiker*, 24 USPQ2d 1443.

CLAIM REJECTION UNDER 35 U.S.C. § 103

Claims 9 - 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art (see specification pages 1 - 4 and Figures 1 - 3), hereinafter AAPA, in view of Roberts et al., U.S. Patent 3,856,135, and Chen et al., U.S. Patent Application 2002/0124388.

It is stated in the last paragraph of page 4 of the Office Action that AAPA discloses apparatus for the cutting of papered battery plates from continuous pasted metal mesh covered on both sides with paper to prevent sticking of paste to the cutter dies on cutter rolls and to the anvil roll and that AAPA also teaches the need for a method of cutting

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paperless battery plates. This teaching or suggestion of a need to make the claimed combination and the reasonable expectation of success must be found in the prior art, not in Applicants' disclosure. *In re Vaack*, 20 USPQ 2d 1438.

Chen et al. disclose the use of paperless battery plates pasted with a paste containing water and polymers to bind inorganic crystals together to form a paste mixture having rheological properties (par. 0020, lines 9 - 12). To prevent sticking of the plates and to promote cohesion and adhesion of the active material to the grid surface, the pasted plates are dried, during which water is flash vaporized and polymerisation occurs. The plates can then be cut without the use of pasting papers since the paste is no longer sticky and does not adhere to the cutting apparatus. This patent then acknowledges that the absence of pasting papers enhances battery performance in that "...pasting papers are not necessary, which will benefit initial electrical performance of the batteries." (par. 0030, lines 7 - 9).

Chen et al. teach that it is beneficial not to have pasting papers but do not teach or suggest how to continuously cut battery plates from continuous strip pasted with a fresh, sticky conventional paste. Applicants are able to continuously paste strip with a fresh, sticky conventional paste and sever the freshly pasted strip to produce battery plates of desired configuration on an assembly line operating at commercial speeds without the need for a polymer binder. The addition of polymer (Figure 2 of Chen et al.) not only requires an additional process step for introducing the polymer to the paste mix but also necessitates a step for polymerisation of the polymer and vaporization of water which renders the Chen et al. product frangible and the paste diluted relative to applicants' product.

Roberts et al. teach a method of filling a battery plate grid with non-flowable battery plate by using vibrational energy, preferably ultrasonic energy applied to the paste to convert the non-flowable paste to a flowable form. Roberts et al. disclose a heated support bar under the sonotrode providing ultrasonic energy to cause paste to flow into the

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interstices of a plate grid. The heated support bar prevents sticking of excess paste to the surface of the support bar. Roberts et al. do not teach or suggest heating of a cutting device for severing pasted continuous metal mesh strip into lengths by penetrating the thickness of metal mesh strip fully saturated with paste extending from one mesh surface to the opposite mesh surface. There is no motivation or suggestion in Roberts et al. to heat a cutting device for elimination of paper from a continuous pasted battery plate production process. The cutting device in Roberts et al. for severing the paste extrusion is in fact not heated.

With respect to Applicants' heating means, Applicants found that the minimum die temperature required to prevent sticking of battery paste to the cutting dies must be above about 150° and below the melting point of the lead alloy of the battery plates, preferably 160 to 300°C, and more preferably 180 to 210°C. Die temperatures below 150° were not effective due to battery paste sticking to the die surfaces (page 6, line 26 to page 7, line 8, particularly page 7, lines 1 and 2). Claim 9 is now limited to a temperature range of about 160 to 300°C and claim 11 is limited to a temperature range of about 180 to 210°C.

Claims 12 – 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Roberts et al. and Chen et al. as applied to claims 9 and 10 above, and further in view of Benton.

Benton discloses a series of heating elements 31 extending lengthwise in the perforating cylinder to heat the perforating or venting pins 30 studded thereon (col. 2, line 58 to col. 3, line 3). It is apparent from Figure 3 that the heating elements are located in the perimeter of the perforating cylinder. Benton does not provide means to heat the anvil roll but conversely cools the anvil roll.

Applicants in distinction have electric cartridge heaters 54 and 61 mounted centrally in the die roll 44 and anvil roll 42 to uniformly heat the die rolls, anvil rolls, cutter blades and index ring to a desired temperature preferably in the range of about 160

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to 300°C and more preferably in the range of 180 to 210°C (page 5, lines 6 – 18). Claims 12 and 13 restrict Applicants' apparatus to heating means mounted axially in each of the rolls along the length of the rolls for simplicity of installation and operation.

Claim 14 has been withdrawn.

Claim 15 has been amended to be substantially parallel to claim 9 and additionally claims electric cartridge means mounted axially on each roll for uniformly heating the cutting blades and opposed rolls to a temperature in the range of about 160 to 300°C. Claim 16 has been cancelled and claim 17 dependent on claim 15 restricts the heating means operative for a heating temperature range of about 180 to 210°C.

It is believed claim 9 and claims 11 – 13 dependent thereon and claim 15 and claim 17 dependent thereon are clearly patentable over the combination of AAPA, Chen et al., Roberts et al. and Benton. To reiterate, neither Roberts et al. nor Chen et al. suggest the desirability of making Applicants' combination as now claimed. Roberts et al. heated a support surface under a sonotrode, providing ultrasonic energy to cause paste to flow into a discrete plate grid, to avoid sticking of excess paste to the surface of the support surface. Chen et al. added a polymer to battery paste to avoid stickiness of the paste. Benton relates to non-analogous prior art and differs significantly from Applicants' invention. These references do not suggest Applicants' combination. These references must be viewed without benefit of impermissible hindsight afforded by the claimed invention and Applicants' disclosure.

Objective evidence of a long-felt need is provided in the Declaration of Mr. Thomas Lester Oswald appended to this amendment, a co-inventor of the present invention and a self-employed consultant to the battery industry with over 40 years of experience in the battery industry. Turning to paragraph 7 of his Declaration, it is evident there has been a long-felt need in the industry for paperless battery plates because of cost considerations

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and production problems such as paper clogging and paper release interfering with cell welding.

With reference to paragraph 6 of his Declaration, the saturation and coating on each side of continuous strip with paste necessitated paper barriers to obviate sticking to the cutter dies and anvil roll, which operate as pressure cut dies. The cutting pressures are high to enable the sharp blades to cut through the pasted material, impressing considerable force on the metal mesh, which was believed to exacerbate sticking of the battery paste to the cutting surfaces, anvil roll and cutter blades.

Reference is made here to U.S. Patent No. 4,275,629 issued June 30, 1981 and cited in this Office Action as a pertinent reference in which it is stated in col. 1, line 64 to col. 2, line 2 *"In a way of general background a conventional battery grid is made by a series of steps consisting of (1) expanding, a metal strip, (2) flattening and sizing the expanded strip, (3) pasting and papering, (4) drying, (5) cutting and separating the pasted, paperbound strip to form grid structures and (6) enveloping the grid by folding a separator around and sealing the same."*

It is further stated in col. 1, lines 44 – 50 *"In the case of cutting completely through a battery grid prepared by conventional operations, the separator-cutter device must effectively cut through metal that has been pasted as well as through at least two webbing materials such as paper and the like. This latter material in conjunction with the others often presents a difficult matter to properly and consistently sever in battery grid manufacture."* This patent is directed to specific cutting knives for severing difficult-to-cut battery grids.


It is evident that the need for paper webbing material, in this case necessitating a specially designed cutter, has been present for many years, and that there has been a long-felt need to obviate the use of paper coverings.

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The Declarant Mr. Oswald confirms that persons skilled in the art have been working on the problem for years and, notwithstanding a long-felt need, were unable to solve the problem.

It is therefore respectfully submitted that the claims as amended comply with all requirements as to form and patentably define Applicants' invention over the cited art. Such favourable consideration is earnestly solicited.

Respectfully submitted,
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